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# Endemic and Rare Species of *Cyperaceae* Family in Iran

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***Cyperaceae*, with about 131 species, is the largest family of subclass *Monocotyledoneae* in Iran after *Poaceae* and *Liliaceae*. In this research, endemic and rare plants belonging to *Cyperaceae* family has been studied in Iran. *Cyperus celans* and *Carex decaulescens* subsp. *brunneola* are endemic plants. Number of 36 taxa has been surveyed as threatened plants. Also, phytogeographical region, index of threatened, life form, habitat, and distribution map has been prepared for each taxon.**

***Keywords:*** *endemic, rare plant, Cyperaceae, Iran*

## INTRODUCTION

*Cyperaceae* belongs to subclass *Monocotyledoneae*, superorder *Commeliniflorae* and order *Cyperales*. With about 4500 to 5000 species in 100 to 105 genera, the *Cyperaceae* are probably the seventh largest family of vascular plants.

The history of research on *Cyperaceae* family in Iran, Flora Orientalis is the oldest reference related to vascular plants in Orient. Boissier (1882) wrote this flora (5 vol.) for plants of Orient. He reported 7 genera and 38 species from Iran. He treated *Blysmus*, *Schoenoplectus*, *Scirpoides* and *Trichophorum* genera in *Scirpus* genus and so *Pycreus* genus in *Cyperus*. Parsa (1950) compiled Iranian plants in 5 volumes and one supplement for the first time. He mentioned 7 genera and 80 species from Iran. He situated several genera into Scirpus genus similar to Boissier. Mobayen (1975) prepared plants of Iran entitled Rostanihaye Iran in Persian following Parsa. He reported 7 genera and 79 species from Iran. Ghahreman (1995), in cormophytes of Iran (vol. 4), reported 7 genera with only number of their species which consist of *Cyperus* (16 species), *Eleocharis* (4 species), *Fimbristylis* (3 species), *Scirpus* (13 species), *Cladium* (1 species), *Carex* (43 species), *Schoenus* (1 species), *Scirpoides* (1 species) from Iran. Kukkonen (1998) wrote *Cyperaceae* family for Flora Iranica area. He reported 15 genera, 105 species and 27 subspecies from Iran. In literature review, totally 16 genera, 143 species and 30 subspecies belonging to *Cyperaceae* family have been reported from Iran.

Recently, *Cyperaceae* family in Iran since 2000 has been studied by us. During the 11 years of studies, many taxa have been introduced as new records from Iran. It has been confirmed 130 species and 29 subspecies belonging to 16 genera of *Cyperaceae* family from Iran.

Iran, with an area of 1648195 square kilometers, is geographically (cold mountainous areas, plains, semidesert, desert and temperate regions) very diverse. Iran has about 8000 species which grow in different geographical areas. There is an obvious intensification of agriculture, reforestation and deforestation, industrial development and these are the most important factors in the extinction of native and rare plants. To protect the plants at first the endangered species must be identified. Jalili & Jamzad (1999) in Red Data Book reported *C. aequivoca* (DD), *C. decaulescens* ssp. *brunneola* (VU), *C. demissa* ssp. *iranica* (VU), *C. oligantha* (DD), *C. oreophila* (DD), *C. physodes* ssp. *subphysodes* (VU), *C. pseudofoetida* ssp. *acrifolia* (LR), *C. rostrata* (DD), *C. tristis* (DD), *C. articulatus* (DD), *C. celans* (DD), *C. macrorrhizus* (DD), *C. steadii* (DD), *E. argyrolepis* (DD), *F. cymosa* (DD), *K. schoenoides* (VU). According to the authors, the data is based on Flora Iranica.

In this research, endemic and rare plants (based on IUCN method) belonging to *Cyperaceae* family have been studied in Iran. This data is the result of almost 11 years of field studies.

## MATERIALS AND METHODS

In this survey, plant materials deposited in the Iranian herbaria and new collected specimens were used. About 2000 specimens and newly collected specimens by the author in natural habitats from Iran were studied.

For these species, phytogeographical regions, map, life form, habitat, distribution and threatened index of species are been prepared.

The phytogeographical regions that concern the flora of Iran are the following: The Irano-Turanian, the Saharo-Sindian Regions and the Hyrcanian province of the Euro-Siberian region (Fig. 1). Details of these are given by Eig (1931-1932) Zohary (1963), Hedge and Wendelbo (1978), Jalili & Jamzad (1999) and Assadi (1988).

The Irano-Turanian Region has always been distinguished from the adjacent Euro-Siberian and

Mediterranean Regions by a series of floristic and vegetation characteristics. Most of the Irano-Turanian Region is dominated by a continental climate, widely ranging in temperature. Rainfall is confined to the winter season which is less extreme in its temperature. Its central and eastern parts have very extreme winter temperatures, and their rainy season is spring and early summer, to which the growing season is thus limited, while winter and late summer are generally resting periods. The local climatic differences are partly responsible for the differences in the flora and vegetation of which should be looked upon as relics of a former climatic period.

In Iran, the Euro-Siberian region is represented by the Hyrcanian Provinces (Mazandaran, Gilan and Golestan provinces). It is confined here to the coastal surroundings of the Caspian Sea and occupies three main habitats: alluvial flats of the coastal plain, the northern slopes of the Elburz Mts. and the subalpine meadows of these mountains. The most outstanding feature of this area is the broad-leaved deciduous forest, which ranges in altitude from sea level to 2500 m above sea level.

The provinces are well distinguished from other areas by high annual precipitation (600-2000 mm), a considerable part of which falls in summer. The high air humidity and the higher winter temperatures at the lower altitudes make the greater part of this area most favourable for mesic forest, not unlike those of western or southern Europe.

Eig (1931-1932) was the first to introduce the name Saharo-Sindian. In Iran, the region covers the sub-tropical flora of the southern part of the country. In this Region there are representatives of Saharo-Arabain, Sudanian and also Irano-Turanian species. Towards the south-west it includes some elements of the Saharo-Arabian flora. Rainfall is limited to the winter season and does not exceed 100 mm per year in most of this Region. The rains are torrential and irregularly distributed. The summer is long and extremely hot and dry. The flora is very poor in species, and it has never been an important centre of speciation. East-wards, the Sudanian subregion are largely nubo-Sindian in its nature, with low but well-distributed rainfall and a relatively rich flora.

As well as Saharo-Arabian and Sudanian elements, some Irano-Turanian elements are seen at higher altitudes and in the northern part of this Region.

Distribution, life form and map of species are based on observation in nature and in some cases are based on herbarium specimens.

In order to determine the species threatened, the IUCN (1994, 2001 and 2004) Red list categories were applied. Species status has been prepared on the basis of six below categories:

**EX:** Extinct
**EW:** Extinct in the Wild
**CR:** Critically Endangered
**EN:** Endangered
**VU:** Vulnerable
**LR:** Lower Risk
**DD:** Data Deficient

The preparation of data has been carried out in the Iranian Research Institute of Plant Protection.

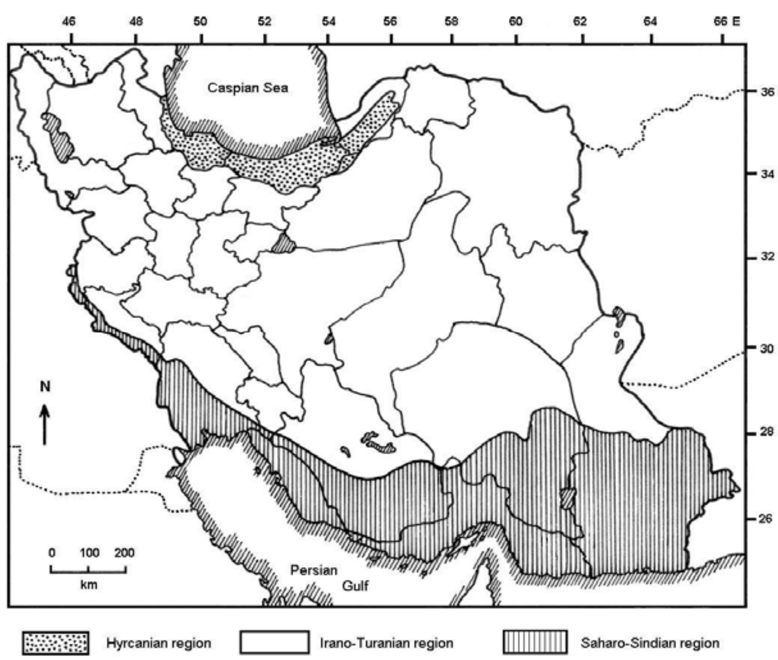



**Fig. 1.** Map of phytogeographical region in Iran

## RESULTS

Among species, *Cyperus celans* and *Carex decaulescens* subsp. *brunneola* are endemic. Below list shows other rare and endangered taxa:

1. *Schoenoplectus supinus* (L.) Palla (Fig. 2)
Phytogeographical region: Saharo-Sindian
Status: EW
Life form: annual
Habitat: On river sides and standing water, in rice field
Distribution: Baluchestan: 10 km E Sarbaz, along Rudkhanehye Sarbaz

2. *Isolepis cernua* (Vahl) Roem. & Schult. (Fig. 2)
Phytogeographical region: Hyrcanian
Status: EN
Life form: annual
Habitat: on wet places by standing water
Distribution: Gilan: Langeroud, Chamkhaleh

3. *Erioscirpus comusus* (Wall.) Palla (Fig. 2)
Phytogeographical region: Saharo-Sindian
Status: EW
Life form: perennial
Habitat: Rock crevices
Distribution: Baluchestan: Chabahar to Iranshahr, Tange Sorkheh

4. *Eleocharis argyrolepis* Kierulff (Fig. 2)
Phytogeographical region: Irano-Turanian
Status: LR
Life form: perennial
Habitat: in shallow water
Distribution: Azerbaijan-W: 12-25 km Maku

5. *Eleocharis atropurpurea* (Retz.) J. Presl. (Fig. 2)
Phytogeographical region: Irano-Turanian
Status: VU
Life form: annual
Habitat: in rice field
Distribution: Khuzestan: Izeh, Dehdez, Bar Aftab Village

6. *Fimbristylis miliacea* (L.) Vahl (Fig. 2)
Phytogeographical region: Irano-Turanian
Status: LR
Life form: annual
Habitat: in rice field
Distribution: Khuzestan: Izeh, Susan, Mehreno Village

7. *Fimbristylis cymosa* R. Br. (Fig. 2)
Phytogeographical region: Saharo-Sindian
Status: EW
Life form: perennial
Habitat: in standing water
Distribution: Hormozgan: Kuhha-ye Genu, near Isin

8. *Fimbristylis squarrosa* Vahl (Fig. 2)
Phytogeographical region: Hyrcanian
Status: VU
Life form: annual
Habitat: in rice field
Distribution: Gilan: Rasht, Ahmad Gurab

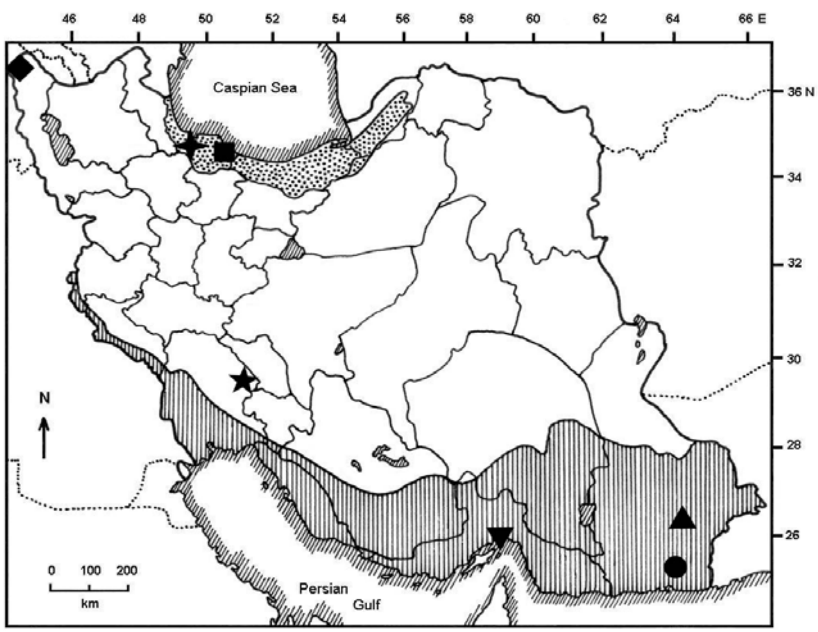



**Fig. 2.** ■ *Isolepis cernua, Fimbristylis dichotoma, Cyperus eragrostis, Carex extensa*; ● *Erioscirpus comusus*; ▲ *Schoenoplectus supinus*; ▼ *Fimbristylis cymosa*; ◆ *Eleocharis argyrolepis*; ★ *Eleocharis atropurpurea*, *Fimbristylis miliacea*, *Cyperus iria*; ✦ *Fimbristylis squarrosa*, *Cyperus dives*

9. *Fimbristylis dichotoma* L. (Fig. 2)
Phytogeographical region: Hyrcanian
Status: CR
Life form: perennial
Habitat: on wet places by standing water
Distribution: Gilan: Rudsar, Coast to Caspian Sea

10. *Fuirena pubescens* (Poir.) Kunth (Fig. 3)
Phytogeographical region: Irano-Turanian
Status: CR
Life form: perennial
Habitat: Streamside
Distribution: Kerman: Kahnuj, Faryab, Mehruyeh

11. *Cyperus dives* Delile (Fig. 2)
Phytogeographical region: Hyrcanian
Status: EN
Life form: perennial
Habitat: river shores or in shallow water
Distribution: Gilan: Bandar-e Anzali

12. *Cyperus articulatus* L. (Fig. 3)
Phytogeographical region: Saharo-Sindian
Status: EW
Life form: perennial
Habitat: in shallow water and marshy ground
Distribution: Khuzestan: Khorramshahr

13. *Cyperus malaccensis* Lam. (Fig. 3)
Phytogeographical region: Saharo-Sindian
Status: LR
Life form: perennial
Habitat: Alluvial meadows and marshy ground
Distribution: Khuzestan: Khorramshahr

14. *Cyperus iria* L. (Fig. 2)
Phytogeographical region: Irano-Turanian
Status: EN
Life form: annual
Habitat: in irrigated fields, rice field
Distribution: Khuzestan: Izeh, Susan, Mehreno Village

15. *Cyperus celans* Kukkonen (Fig. 3)
Phytogeographical region: Saharo-Sindian
Status: CR
Life form: perennial
Habitat: in rock crevices and coastal sands
Distribution: Hormozgan: Hormoz Island

16. *Cyperus macrorrhizus* Nees (Fig. 3)
Phytogeographical region: Saharo-Sindian
Status: VU
Life form: perennial
Habitat: sand plains in desert
Distribution: Kerman: Fahraj, Chah Rigan, Bagh-e Lut

17. *Cyperus eragrostis* Lam. (Fig. 2)
Phytogeographical region: Hyrcanian
Status: EW
Life form: perennial
Habitat: in standing coastal water
Distribution: Gilan: Rudsar

18. *Cyperus michelianus* (L.) Delile (Fig. 3)
Phytogeographical region: Hyrcanian
Status: CR
Life form: annual
Habitat: in alluvial river shores
Distribution: Gilan: 5 km Astara to Hashtpar, Talab-e Style

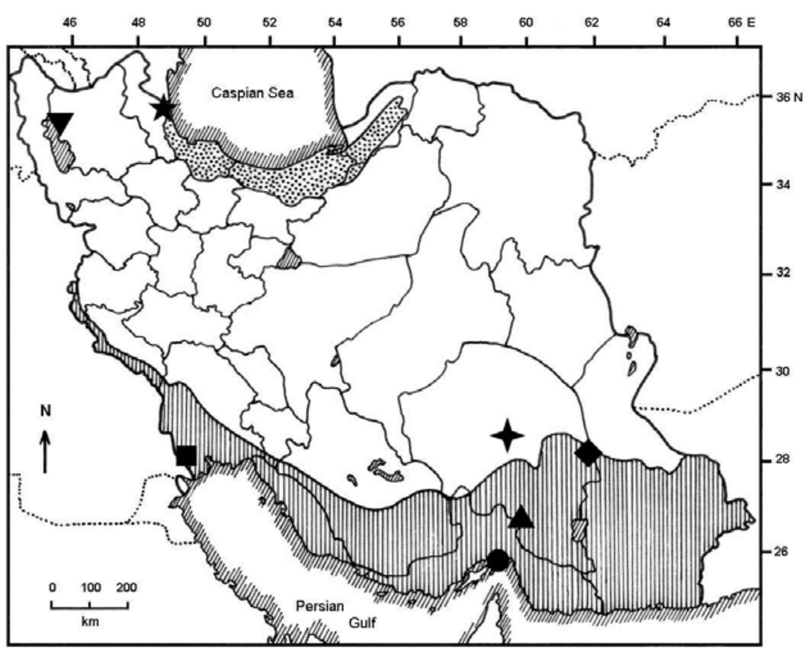



**Fig. 3.** ■ *Cyperus articulatus, Cyperus malaccensis*; ● *Cyperus celans*; ▲ *Fuirena pubescens*; ▼ *Cyperus pannonicus*; ◆ *Cyperus macrorrhizus*; ★ *Cyperus michelianus*; ✦ *Kobresia humilis*

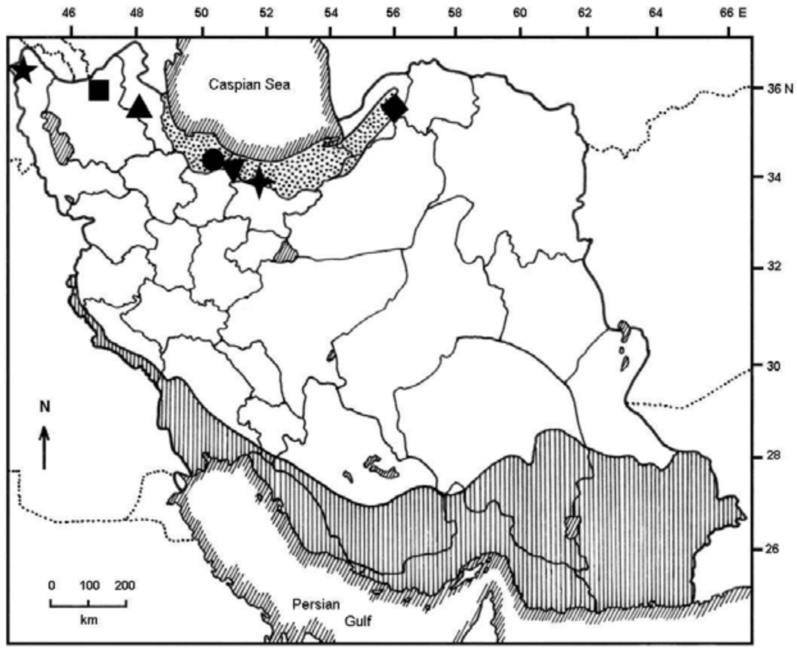



**Fig. 4.** ■ *Carex vulpina, Carex capillaris*; ● *Carex pamirica*; ▲ *Kobresia schoenoides, Carex rostrata*; ▼ *Carex humilis*; ◆ *Carex depauperata*; ★ *Carex cilicica, Carex supina*; ✦ *Carex kukkonenii*, *Carex decaulescens* subsp. *brunneola*

19. *Cyperus pannonicus* Jacq. (Fig. 3)
Phytogeographical region: Irano-Turanian
Status: CR
Life form: perennial
Habitat: in alluvial river shores
Distribution: Azerbaijan-W: N. Orumieh, Bandar Sharafkhaneh

20. *Kobresia humilis* (C.A. Mey. ex Trautv.) Serg. (Fig. 3)
Phytogeographical region: Irano-Turanian
Status: VU
Life form: perennial
Habitat: alpine meadows from 3550-4000 m
Distribution: Kerman: Baft, Lalehzar mountain

21. *Kobresia schoenoides* (C.A. Mey.) Steud. (Fig. 4)
Phytogeographical region: Irano-Turanian
Status: VU
Life form: perennial
Habitat: in mountains from 3700-4000 m
Distribution: Ardebil: Meshkin Shahr, Qotur Sou, Sabalan mountain

22. *Carex vulpina* L. (Fig. 4)
Phytogeographical region: Irano-Turanian
Status: CR
Life form: perennial
Habitat: wet meadows in mountain
Distribution: Azarbaijan-E: Arasbaran Area, Kuhe Doghroun

23. *Carex pamirica* (O. Fedtsch.) O. & B. Fedtsch. ex B. Fedtsch. (Fig. 4)
Phytogeographical region: Hyrcanian
Status: EN
Life form: perennial
Habitat: stream sides in mountain
Distribution: Gilan: Lowshan, Kelishom Village, Holosh Kuh

24. *Carex rostrata* Stokes (Fig. 4)
Phytogeographical region: Irano-Turanian
Status: CR
Life form: perennial
Habitat: in mountain river sides
Distribution: Ardebil: Meshkin Shahr, Qotur Sou, Shabil

25. *Carex capillaris* L. (Fig. 4)
Phytogeographical region: Irano-Turanian
Status: CR
Life form: perennial
Habitat: wet meadows in mountain
Distribution: Azerbaijan-E: Arasbaran Area, Kuhe Doghroun

26. *Carex depauperata* Curtis ex With. (Fig. 4)
Phytogeographical region: Hyrcanian
Status: EN
Life form: perennial
Habitat: forested mountain slopes
Distribution: Golestan: Park Melli Golestan, Around Water fall

27. *Carex extensa* Good. (Fig. 2)
Phytogeographical region: Hyrcanian

Status: CR
Life form: perennial
Habitat: in coastal sands
Distribution: Gilan: Langeroud, Chamkhaleh, Hasan Bekandeh
28. *Carex cilicica* Boiss. (Fig. 4)
Phytogeographical region: Irano-Turanian
Status: LR
Life form: perennial
Habitat: wet meadows in mountain
Distribution: Azarbaijan-W: 10km Maku to Maku Dam
29. *Carex supina* Willd. ex Wahlenb. (Fig. 4)
Phytogeographical region: Irano-Turanian
Status: EN
Life form: perennial
Habitat: dry meadows
Distribution: Azerbaijan-W: Bazargan, Boralan
30. *Carex humilis* Leysser (Fig. 4)
Phytogeographical region: Hyrcanian
Status: VU
Life form: perennial
Habitat: wet alpine meadows
Distribution: Mazandaran: Rudbar to Ramsar, Javaher Dasht, Samamus (Mt)
31. *Carex kukkonenii* Ö. Nilsson (Fig. 4)
Phytogeographical region: Irano-Turanian
Status: VU
Life form: perennial
Habitat: wet alpine meadows
Distribution: Tehran: Karaj to Chalus, Kelwan
32. *Carex melanantha* C.A. Mey. (Fig. 5)
Phytogeographical region: Hyrcanian
Status: EW
Life form: perennial
Habitat: wet alpine meadows
Distribution: Mazandaran: Baladeh, Shahzade Kuh
33. *Carex acuta* L. (Fig. 5)
Phytogeographical region: Irano-Turanian
Status: CR
Life form: perennial
Habitat: river shores
Distribution: Kordestan: Sanandaj, 1.5 km Sarab Ghamish
34. *Carex elata* All. (Fig. 5)
Phytogeographical region: Irano-Turanian
Status: EW
Life form: perennial
Habitat: in eutrophic lakes, in shallow water
Distribution: Kordestan: Marivan, lake Zarivar
35. *Carex decaulescens* V. Krecz. subsp. *decaulescens* (Fig. 5)
Phytogeographical region: Irano-Turanian
Status: EW
Life form: perennial
Habitat: mountain meadows
Distribution: Khorasan: Mashhad, Binalud mountain
36. *Carex decaulescens* V. Krecz. subsp. *brunneola* Kukkonen (Fig. 4)
Phytogeographical region: Irano-Turanian
Status: CR
Life form: perennial
Habitat: mountain meadows
Distribution: Tehran: Tochal mountain

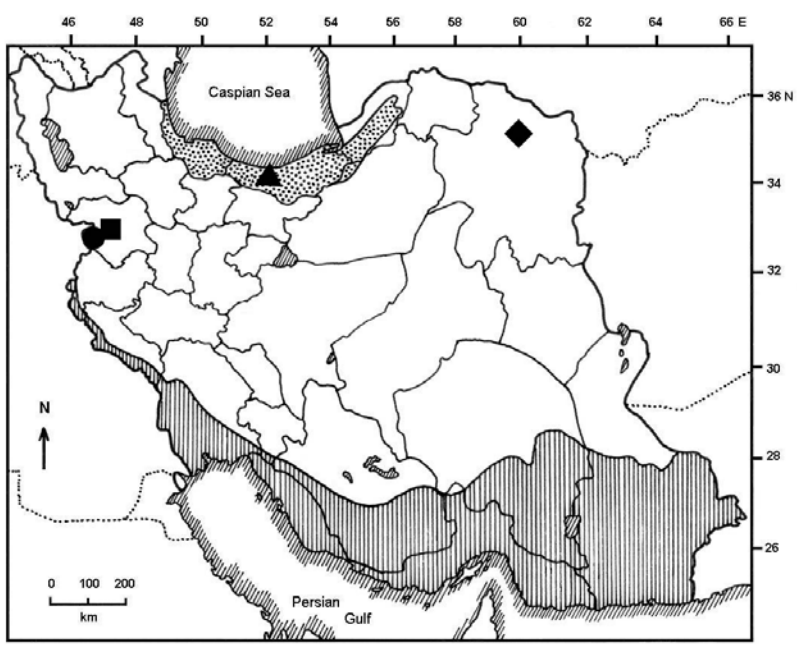



**Fig. 5.** ■ *Carex acuta*; ● *Carex elata*; ▲ *Carex melanantha*; ◆ *Carex decaulescens* subsp. *decaulescens*

## DISCUSSION

In Iran, *Cyperaceae* family include 16 genera, 130 species and 29 subspecies of which *Cyperus celans* and *Carex decaulescens* subsp. *brunneola* are endemic. In this research, number of 36 species has been studied as rare plants. These plants mostly were found in one (rarely two) locality in Iran. Jalili & Jamzad (1999) reported 16 species as rare plant in Red Data Book of Iran. According to the authors, data were obtained from the literature, particularly Flora Iranica (Rechinger) and they had no observation in nature. Most of species has been listed as DD (data deficient), while many of these species have been recently collected from different localities and there is perfect data for their. From the given list, *Carex aequivoca*, *Carex oligantha* and *Carex tristis* is not confirmed from Iran as yet. Also below species is found some localities in Iran and they are not considered as threatened plants: *Carex demissa* ssp. *iranica*, *Carex oreophila*, *Carex physodes* ssp. *subphysodes*, *Carex pseudofoetida* ssp. *acrifolia* and *Cyperus steadii*. The rest of species are as threatened plants which include: *Carex decaulescens* ssp. *brunneola*, *Carex rostrata*, *Cyperus articulatus*, *Cyperus celans*, *Cyperus macrorrhizus*, *Eleocharis argyrolepis*, *Fimbristylis cymosa* and *Kobresia schoenoides*.

**Table 1.** Endemic and threatened plants in phytogeographical regions in Iran

| Phytogeographical regions | Number of threatened taxa | Number of endemic species |
|---|---|---|
| Hyrcanian | 11 | - |
| Irano-Turanian | 18 | 1 |
| Saharo-Sindian | 7 | 1 |

Among studied species, 8 taxa are EW (extinct in the wild) and we could not find those in nature. Status of other species is as follows: 11 taxa CR (critically endangered), 6 taxa EN (endangered) 7 taxa VU (vulnerable) and 4 taxa LR (lower risk).

As mentioned above, Iran has three phytogeographical regions, namely Hyrcanian, Irano-Turanian and Saharo-Sindian. The Irano-Turanian region is the richest and, by contrast, the Saharo-Sindian is the poorest in the total number of endemic species and threatened plants (Table 1).

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**İran Folrasının *Cyperaceae* Fəsiləsinin Endemik və Nadir Növləri**

**M. Əmini Rad, V.N. Kərimov**

Təxminən 131 növü əhatə edən *Cyperaceae* fəsiləsi İran florasında Birləpəlilər (*Monocotyledoneae*) yarımsinfinin *Poaceae* və *Liliaceae* fəsilələrindən sonra ən böyük fəsiləsidir. Bu tədqiqat işində İranda *Cyperaceae* fəsiləsinin endemik və nadir növləri öyrənilmişdir. Müəyyən edilmişdir ki, *Cyperus celans* və *Carex decaulescens* subsp. *brunneola* İran florası üçün endemik növlərdir. Əlavə olaraq 36 takson nadir və məhv olmaq təhlükəsi olan növlər kimi təyin edilmişdir. Məqalədə həmçinin hər bir taksonun yayıldığı fitocoğrafi region, məhvolma təhlükəsi indeksi, həyati forması, bitmə yerləri göstərilmiş, yayılma xəritəsi tərtib edilmişdir.

**Эндемичные и Редкие Виды Растений Семейства *Cyperaceae* Флоры Ирана**

**М. Амини Рад, В.Н. Керимов**

Семейство Осоковых (*Cyperaceae*) флоры Ирана, включающее около 131 вида, является крупнейшим семейством подкласса Однодольных (*Monocotyledoneae*) после семейств *Poaceae* и Liliaceae. В данной статье представлены результаты исследования эндемичных и редких видов семейства Осоковых Ирана. Было выявлено, что виды *Cyperus celans* и *Carex decaulescens* subsp. *brunneola* являются эндемичными растениями Ирана и 36 таксонов являются растениями, которым угрожает опасность исчезновения. Кроме того, для каждого таксона указаны ботанико-географические районы, индексы состояния видов, жизненные формы, места обитания и составлены карты их распространения.